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journal or publication title	Asian Economic Journal : journal of the East Asian Economic Association
volume	33
number	2
page range	191-213
year	2019
URL	http://hdl.handle.net/10236/00028199

ASIAN ECONOMIC JOURNAL
Journal of the East Asian Economic Association

What Factors Determine Whether Small and Medium Enterprises Obtain Credit from the Formal Credit Market? The Case of Vietnam*,†

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Received 27 December 2016; Accepted 27 October 2018

Using a survey of Vietnamese small and medium enterprises (SMEs) conducted during 2005–2013, this paper examines the process of applying for a formal loan and the level of satisfaction (credit needs) obtained by SMEs. The empirical results show that banking relationships and the business environment are important factors when applying for and obtaining formal credit. However, positive measures of firms' financial performance, such as a high return on assets score and sales growth, did not have a significant influence on whether firms obtained credit. Formal financial institutions in Vietnam were found to depend too much on collateral assets in assessing whether to supply credit to an SME.

Keywords: credit constraint, formal credit, small and medium enterprises, SMEs, Vietnam.

JEL classification codes: C25, G21, G32.

doi: 10.1111/asej.12183

I. Introduction

This paper aims to identify the factors influencing the ability of Vietnamese small and medium enterprises (VSMEs)' access to credit through traditional lending channels. The study is motivated by the following observations: Firstly, VSMEs have convincingly demonstrated their viability and importance to the country's economy. They account for nearly 98% of total enterprises in Vietnam and 35% of total investment, and they contribute 40% of GDP. However, VSMEs have been coping with many constraints, with a lack of capital being

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the main obstacle to stronger growth (GSO, 2015). Second, although many VSMEs lack access to credit, only approximately 30 percent have applied for formal credit and only half of them feel satisfied with the amount of credit they received according to recent small and medium enterprise (SME) surveys (Cao, 2015). Third, identifying the factors affecting VSMEs' ability to obtain credit from formal lending institutions will shed light on policies that can potentially support the growth of the VSMEs.

Major studies investigating VSMEs' access to credit from formal lending institutions include Rand (2007), Vo et al. (2011), Le (2012), Nguyen and Luu (2013) and Cao (2015). Nguyen and Luu (2013) looked solely into VSMEs' applications for loans without investigating whether firms obtained loans. Rand (2007) examined firms' success in obtaining credit by observing two groups of VSMEs: those that needed funds but did not apply for credit and those that applied but were not satisfied with the result of their application. Rand's study did not specifically examine whether firms whose application for credit was accepted obtained the amount that they applied for. Following a different approach, Vo et al. (2011) used data from 10 financial institutions in Hanoi, noting that some firms perceived that they received only a portion of the credit they applied for, while others procured their desired credit amount in full. Le (2012) examined firms that had obtained credit based on those firms' liability information but did not investigate why firms apply for credit. Cao's (2015) study thoroughly investigated the influential factors at all stages of the process, from applying for to obtaining credit, based on 2009 and 2011 surveys of VSMEs. However, due to the limitations of using cross-sectional data, Cao's study could not show the full picture of SME financing in Vietnam over a longer period.

The present study attempts to overcome the aforementioned shortcomings of previous studies and offers some notable contributions. First, by using panel data (of both unbalanced and balanced data) calculated from the most updated surveys of VSMEs, the study provides insight into recent changes in the credit approval process for VSMEs, especially before and after the 2008 financial crisis. The entire process from applying for a formal loan to being satisfied with that loan is outlined. Second, by using firms' subjective perceptions of a lack of available credit, the relationship between financial institutions and firms, and the provincial competitiveness index (PCI) as explanatory variables of accessing formal credit, we were able to obtain new findings. Notably, unlike previous studies, this study uses evidence from firms to explain the determinants of whether VSMEs are satisfied with formal credit providers. Third, in terms of analytical techniques, a probit model with sample selection was used to analyze firms' satisfaction after applying for formal credit. Neither panel data nor the models with sample selection have been used in previous studies.

The paper's empirical analysis reveals that banking relationships and the firm's business environment are important factors both in applying for and obtaining formal credit. However, we found that Vietnamese financial institutions heavily rely on collateral assets in assessing whether to supply credit and

place little importance on data that demonstrates firms' performance, such as a high return on assets (ROA) score and sales growth. The empirical results obtained in this study should shed light on relevant policies for granting credit. The role of the regional business environment in obtaining formal credit was proven, which implies that to help increase VSMEs' access to formal credit, policy-makers should focus not only on increasing financial institutions' credit supply but also on improving the business environment for VSMEs. Furthermore, financial institutions should pay more attention to a VSME's financial performance and a formal business plan with financial projections that is reviewed with bankers to reduce their dependence on tangible assets when supplying credit. In addition, the results show that more firms should apply because although they may not receive the full amount requested, the probability of being rejected outright is very low.

The rest of this paper is organized as follows. Section 2 reviews previous research into VSMEs' access to credit. Section 3 explains the method used for statistical analysis and provides an overview of our datasets. Section 4 presents the results of our empirical analysis and discusses the results. Section summarizes the study's findings and recommends possible policy reforms aimed at improving VSMEs' access to credit.

II. Literature Review on Vietnamese Small and Medium Enterprise Finance

Many studies have been conducted to explain SMEs' access to formal credit theoretically. The 'relationship lending theory' states that if a close, long-term relationship between a lender (financial institution) and a borrower (firm) is developed, necessary information is more easily provided to the lender. This will encourage the lender to make more credit available to the firm and will allow the firm to borrow at a lower cost (Petersen and Rajan, 1994). The 'transaction lending theory' argues that lenders should judge whether to offer a firm credit on the basis of the firm's financial statements and collateral to resolve the problem of information asymmetry (Berger and Udell, 2006).

From an empirical perspective, a firm's trustworthiness and relationship with its bank are often cited as the factors that determine whether firms obtain credit from financial institutions. For example, attributes such as being large-scale, having audited financial statements, and being in a good financial condition increase the trustworthiness of a firm and make it more likely to have a credit application approved (Beck, 2007; Barth et al., 2011). Past studies have shown that state-owned firms dealing with state-owned banks (Li et al., 2008) as well as firms that have done business with a bank for a long period of time (Uchida, 2011) and have made prompt repayment on previous loans (Cole, 1998; Rand et al., 2009) are able to obtain credit more easily than the others.

Previous studies on access to formal credit for SMEs in Vietnam have mostly been based on surveys, such as the SME surveys conducted by the Central Institute for Economic Management (CIEM) (Rand, 2007; Rand et al., 2009; Nguyen and Luu, 2013; and Cao, 2015), a survey of SMEs conducted in 2010 by the ERIA Research Project (Vo et al., 2011) and an SME survey in 2005 conducted by the World Bank (Le, 2012). Rand et al. (2009) showed that only 39 percent of VSMEs have access to bank credit. A firm's home province, financial condition, amount of preferred types of collateral and creditworthiness were the determinants of VSMEs' access to bank finance (Rand, 2007; Le, 2012). On the basis of the number of firms whose credit requests were rejected, Vo et al. (2011) concluded that the number of years a firm has been in operation, the number of credit institutions it has approached for credit and the networks of the firms' owner(s) were significant influences on the probability of receiving credit. In addition, Cao (2015) concluded that while the business environment plays an important role in encouraging firms to apply for formal credit, collateral assets are the primary determinant of a VSME's ability to obtain credit.

The present study expands on the work of these prior studies, incorporating the insightful techniques they used and attempting to address their limitations. Specifically, this study uses an updated version of the panel datasets used in past studies to provide insight into recent changes in the credit approval process for Vietnamese firms, before and after the 2008 global financial crisis. Furthermore, we investigate the impact of other factors not considered in prior research, including firm owners' political ties (a highly scrutinized issue in transitional economies), firms' future project activities (which demonstrate how firms plan to use external funds) and firms' lack of credit (which indicates why firms decide to apply for external funds).

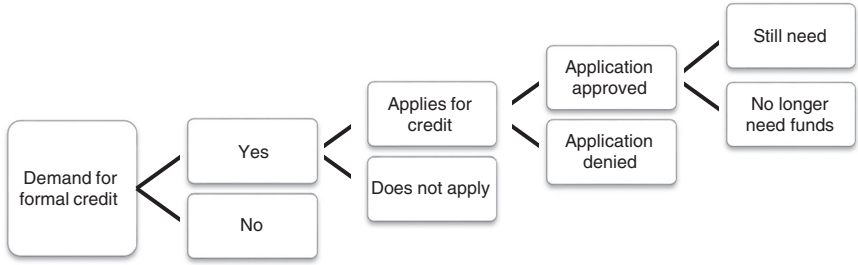
III. Analysis of Access to Formal Credit Channels in Vietnam

III.1 Framework of the analysis

To begin the analysis of VSMEs' behavior in applying for and obtaining formal credit, we summarize the process in applying for and obtaining formal credit in Figure 1.

As the above chart shows, there are three stages that firms with a demand for formal credit may go through: applying for credit, obtaining credit, and having their credit needs satisfied. To analyze VSMEs' applications for formal credit in detail, including whether their credit applications are approved and their satisfaction with that credit, this study proposes three empirical models. The first model investigates the determinants of whether firms apply for formal credit. The second model investigates the determinants of whether firms obtain formal credit. The third model investigates the determinants of whether firms are satisfied with their credit. First, we employ the logit model, the traditional model for analyzing SMEs' access to bank loans. The dependent variable of this model is binary,

Figure 1 Process of applying for and obtaining formal credit



Source: Authors described

taking the value of 0 if the firm did not apply for a bank loan and 1 if the firm did. Second, the probit model with sample selection is used to assess the influence of a firm's attributes, its creditworthiness and the business environment on the probability of obtaining formal credit. Third, the probit model with sample selection is used to determine which factors affect firms' satisfaction after obtaining loans from financial institutions.

We divide the explanatory variables into four groups: variables expressing VSMEs' lack of credit, variables associated with the 'relationship lending theory', and variables associated with the 'transaction theory', in addition to variables expressing the firms' business environment. The explanatory variables are described in detail in the next section, which presents the empirical models used in this investigation.

III.2 Empirical models

Model 1: Estimation of probability of applying for formal credit

$$\begin{aligned}\text{Prob}\left(APPLY_{i,t}=1\right)=\Lambda(&\beta_0+\beta_1' lackcredit_{i,t-1}+\beta_2' bank\_relation_{i,t}\\&+\beta_3' political_{i,t}+\beta_4' financialstatement_{i,t-1}\\&+\beta_5' collateral_{i,t}+\beta_6' firm\_characteristics_{i,t}\\&+\beta_7' owner\_characteristics_{i,t}+\beta_8' business\_environment_{i,t}).\end{aligned}$$

Model 2: Estimation of probability of obtaining formal credit

$$\begin{aligned}\text{Prob}\left(OBTAIN_{i,t}=1\right)=&\alpha_0+\alpha_1' bank\_relation_{i,t}+\alpha_2' political_{i,t}\\&+\alpha_3' financialstatement_{i,t-1}+\alpha_4' collateral_{i,t}\\&+\alpha_5' firm\_characteristics_{i,t}+\alpha_6' owner\_characteristics_{i,t}\\&+\alpha_7' business\_environment_{i,t}+u_{i,t}.\end{aligned}$$

We use Model 2 only when $APPLY_{i,t} > 0$.

Model 3: Estimation of probability of needing credit after obtaining

$$\begin{aligned}\text{Prob}\left(STILL\_NEED_{i,t}=1\right) = {} & \gamma_0 + \gamma_1' bank\_relation_{i,t} + \gamma_2' political_{i,t} \\ & + \gamma_3' financialstatement_{i,t-1} + \gamma_4' collateral_{i,t} \\ & + \gamma_5' firm\_characteristics_{i,t} + \gamma_6' owner\_characteristics_{i,t} \\ & + \gamma_7' business\_environment_{i,t} + v_{i,t}.\end{aligned}$$

We use Model 3 only when $OBTAIN_{i,t} > 0$.

In the above formulas, 'i' represents the concerned firm, 't' represents the year the surveys were conducted and '$\Lambda(\cdot)$' represents the cumulative distribution function of this logistic distribution. Dependent variables represent whether firms apply for formal credit (using a dummy variable), whether they obtain credit (using a dummy variable) and whether firms are still in need of more credit (using a dummy variable). Explanatory variables and parameters in these formulas are expressed as vectors.

To investigate whether firms lacking in credit apply for formal credit, we use two variables. The first represents a firm's self-evaluation of whether a lack of credit was the biggest obstacle to its growth in the previous period. The second represents whether a firm plans to start new projects in the near future. For variables associated with the relationship lending approach, we chose to use a variable representing whether a firm had previously made a deposit in and received any loans from a given bank as a proxy for the firm's banking relationships. We also investigate whether the firm owners' social position, or more precisely their political ties, has any impact on the firm's access to credit. For variables associated with the transaction lending approach, we use proxies for a firm's collateral strength, including total assets and possession of land use rights (land possession). We also use the firm's financial statement variables (ROA, sales growth and outstanding debt ratio), applying a one-period lag. We assume that ROA and sales growth indicate a firm's profitability and performance, while the outstanding debt ratio implies the required amount of credit. Moreover, as the business environment is thought to have a positive effect on a firm's probability of applying for credit, to represent the business environment we use PCI scores and a dummy variable describing whether the data was collected before or after the 2008 global financial crisis, giving the value of 1 to the data collected after 2008. In addition, we add firms' attributes and owners' attributes as control variables.

III.3 Data description

The main dataset used in this paper is from a survey on VSMEs conducted in the years 2005, 2007, 2009, 2011 and 2013. The surveys were undertaken by the CIEM of the Ministry of Planning and Investment (MPI), the Institute of Labor

Science and Social Affairs (ILSSA) of the Ministry of Labor, Invalids and Social Affairs (MOLISA), the Economic Department of Copenhagen University, the United Nations University (UNU-WIDER) and the Embassy of Denmark in Vietnam with the purpose of examining the Vietnamese business environment.[1] Each of these was a comprehensive survey of approximately 2500 manufacturing SMEs in 10 provinces (Hanoi, Hai Phong, Ho Chi Minh, Ha Tay, Phu Tho, Nghe An, Quang Nam, Khanh Hoa, Lam Dong and Long An).

To eliminate unsuitable firms from the sample, we exclude firms that had ceased doing business for 1 year, firms controlled by the state (such as state-owned firms and local state enterprises), joint venture firms with foreign capital, and firms primarily using special, official bank loans such as loans from the Social Policy Bank, the Development Assistant Fund, and the Targeted Program. We also exclude firms that use interest-free loans from family, relatives and friends as their primary source of credit. After cleaning the data, we obtained the panel set shown in Table 1.

As shown in Table 1, only approximately 15 percent of total firms were included in all five surveys. Considering the limitations imposed by the size of the samples, we decided to use the firms included in any of the five surveys as balanced panel data and also to use the whole sample as unbalanced panel data to test the robustness as well as to compare the estimation results.

Tables 2 and 3 show an overall picture of VSMEs' access to formal credit, the reasons some firms did not have access to credit, why some firms were still in need of a loan after applying, and why the others did not need additional credit after applying. The statistical results reveal that the percentage of firms that did not apply for formal credit increased after 2009. This percentage increased from 65.2 percent in 2005 to 65.5 percent in 2009 and to 76.2 percent in 2013. After analyzing the reason why firms did not apply for formal credit, we found that more than 70 percent of them had no demand for formal credit, and nearly 30 percent of them were discouraged from applying.[2] Notably, more than half of the firms that did not apply for formal credit did borrow from an informal credit channel at a high interest rate. Approximately 41 percent of firms with no demand for formal credit borrowed using informal credit, and 74 percent

1 The author would like to thank Professor John Rand and Doctor Neda Trifkovic from Copenhagen University for supplying raw datasets. All mistakes in cleaning data are the author's responsibility.

2 In the interview conducted for the survey, the question 'Has your firm applied for bank loans or other formal credit since the last survey?' was asked first. If the answer was 'no', the interviewer moved to the next question: 'Why has your firm not applied for formal loans since the last survey?'. The possible answers to this question were: 'Because (1) my firm had inadequate collateral, (2) my firm does not want to incur debt, (3) the process was too difficult, (4) my firm did not need one, (5) interest rates were too high, (6) my firm was already heavily indebted, (7) (other reason)'. If the respondent gave the answer '(2) my firm does not want to incur debt', or '(4) my firm did not need one', their firm is assumed to have no demand, and those respondents that selected any of the remaining reasons are assumed to own firms that do have demand for credit.

Table 1 Panel structure of the sampled small and medium enterprises (observations: 4410)

Frequency	*Cumulative frequency (%)*	*2005*	*2007*	*2009*	*2011*	*2013*
675	15.31	1	1	1	1	1
523	27.17	1				
425	36.80					1
361	44.99	1	1			
303	51.86				1	1
298	58.62	1	1			
292	65.24	1	1	1	1	
228	70.41			1	1	1
169	74.24				1	
1136	100	Other patterns				
4410	100					

Source: Sample data extracted from the small and medium enterprise surveys

of those that were discouraged from applying for formal credit accessed informal credit. Furthermore, the trend of using formal external credit decreased over time after the global financial crisis. This implies that VSMEs prefer to use other credit channels when the formal credit market is tight and lending conditions are stricter.

Regarding the level of success in obtaining credit after applying, we found that once firms applied for formal credit, the probability of receiving a loan from a formal financial institution was extremely high (more than 90 percent), and only 20 percent of those that applied for formal credit faced problems in applying. However, the percentage of firms that were still in need of an additional loan after obtaining some formal credit accounted for more than 60 percent on average.

To analyze the behavior of firms applying for and obtaining bank loans, we used items related to firms' attributes, owners' attributes, assets, liabilities, credit, networks and economic constraints. The value for total assets was used in logarithmic form, and revenue and outstanding debt figures were computed as a percentage of total assets with a one-period lag. Additional independent variables such as 'credit constraints' and 'new projects in near future' were created based on the firms' answers in questionnaires.

The second dataset used in this study comprises data from the period 2005–2013, from the PCI developed by the Vietnamese Chamber of Commerce and Industry (VCCI) and the U.S. Agency for International Development-supported (see Table 4) Vietnam Competitiveness Initiative (USAID/VNCI). These data include: assessments of entry costs; access to land; transparency and access to information; time costs of regulatory compliance; informal charges; and the proactivity of provincial leadership, business support services, labor training, and legal institutions. The final index is scaled to 100 with five rankings: very good, good, fair, low and very low. The reason for using this dataset stems from the assumption that a good business environment with more positive

Table 2 Small and medium enterprise access to formal credit from 2005 to 2013

Applied	*2005*	*2007*	*2009*	*2011*	*2013*	*Total*
No	1613	1562	1525	1666	1592	7958
(%)	65.17	67.94	65.54	73.68	76.21	69.50
Yes	862	737	802	595	497	3493
(%)	34.83	32.06	34.46	26.32	23.79	30.50
Problems in getting loan	163	156	179	166	118	782
(%)	18.91	21.17	22.32	27.90	23.74	22.39
Obtained at least once time	814	708	786	557	465	3330
(%)	94.43	96.07	98.00	93.61	93.56	95.33
Still in need after applying	557	437	502	322	278	2096
(%)	64.62	59.29	62.59	54.12	55.94	60.01
Total	2475	2299	2327	2261	2089	11 451

government interventions, more transparent information and less informal costs would help VSMEs to access formal credit more easily.

The definitions of variables and their statistical descriptions are shown in Table 5.

IV. Empirical results

IV.1 Empirical results with unbalanced data

The analytical technique employed and the panel data allowed us in principle to use three empirical models to perform probability estimations: the pooling model, the random-effect model and the fixed-effect model. We conducted the Hausman test to check the significance of the fixed-effect model versus the random-effect model. Our results were $Chi^2(19) = 88.79$ and $Prob > chi^2$ is 0.000. However, it is thought to be difficult to use nonlinear estimation models, such as the logit regression model, to test the significance of the fixed-effect model (Yamamoto, 2015). Therefore, we adopt the estimation results of the fixed-effect model and present the results of the pooling model and the random-effect model for comparison. The estimation results are summarized in Table 6 for the unbalanced dataset and in Table 7 for the balanced dataset.

The impact of variables related to firms' lack of credit

The results show that VSMEs that consider a lack of credit to be the biggest constraint to growth have a 1-percent higher probability of applying for formal credit in the fixed-effect model and a 5-percent higher probability in the pooling model than firms that do not consider it to be their greatest constraint. This implies the importance of the role of formal credit channels in supplying credit for VSMEs. However, the variable representing whether a firm planned to start

Table 3 Why small and medium enterprises did not apply for formal loan

Reasons	*2005*	*2007*	*2009*	*2011*	*2013*	*Total*
(1) Had no demand for formal credit	1160	1173	1126	1225	1100	5784
(%)	71.92	75.10	74.92	74.70	70.20	73.35
Did not want to incur debt	239	297	176	250	264	1226
Did not need one	921	876	950	975	836	4558
Borrowed informal credit (1)	129	510	602	618	542	2401
(%)	11.12	43.48	53.46	50.45	49.27	41.51
(2) Had demand but was discouraged	453	389	377	415	467	2101
(%)	28.08	24.90	25.08	25.30	29.80	26.65
Inadequate collateral	135	104	79	46	39	403
Process too difficult	214	138	148	120	148	768
High interest	81	97	102	210	206	696
Already heavily in debt	17	29	20	15	22	103
Other	6	21	28	24	52	131
Borrowed via informal credit (2)	239	292	328	332	356	1547
(%)	52.76	75.06	87.00	80.00	76.23	73.63
Total (1) + (2)	1613	1562	1503	1640	1567	7885
Borrowed via informal credit	368	802	930	950	898	3948
(%)	22.81	51.34	61.88	57.93	57.31	50.07
Table 3.1 Still in need of a loan after applying						
	2005	*2007*	*2009*	*2011*	*2013*	*Total*
No	305	1565	300	273	227	2670
(%)	35.34	68.07	37.36	45.81	44.60	52.66
Yes	558	734	503	323	282	2400
(%)	64.66	31.93	62.64	54.19	55.40	47.34
Total	863	2299	803	596	509	5070
Table 3.2 Reasons why small and medium enterprises were still in need						
Reason	*2005*	*2007*	*2009*	*2011*	*2013*	*Total*
To pay debt	13	16	28	17	22	96
Recurring expenditures	39	109	83	66	71	368
Investment	502	564	380	232	177	1855
Other	5	45	12	8	13	83
Total	559	734	503	323	283	2402
Table 3.3 Why small and medium enterprises did not need more						
Reason	*2007*	*2009*	*2011*	*2013*	*Total*	
Had enough funds	426	86	74	56	642	
Did not need to invest	496	96	87	90	769	
Other	643	118	112	76	949	
Total	1565	300	273	222	2360	

up new projects or a new product line in the near future did not have a statistically significant impact on the probability that the firm will apply for formal credit. Surprisingly, this factor reduces the probability that a firm will obtain credit and, therefore, increases the probability the firm will still be in need after applying.

Table 4 PCI of 10 provinces from 2005–2013

	2005	*2007*	*2009*	*2011*	*2013*
Ha Noi	60.3	56.7	58.2	58.3	57.7
Ho Chi Minh	59.6	64.8	63.2	61.9	61.2
Hai Phong	59.4	53.2	57.6	57.1	59.8
Ha Tay	38.8	56.7	58.2	58.3	57.7
Long An	58.5	58.8	64.4	67.1	59.4
Phu Tho	54.4	55.6	53.3	60.3	53.9
Quang Nam	59.7	62.9	61.1	63.4	58.8
Nghe An	59.6	49.8	52.6	55.5	55.8
Khanh Hoa	54.1	52.4	58.7	59.1	57.5
Lam Dong[3]	52.3	49.9	52.9	51.8	57.2

Source: Derived from provincial competitiveness index (PCI) data (http://pcivietnam.org)

The impact of variables associated with relationship banking

We found that VSMEs with a score of 1 for the relationship banking proxy (i.e. those that had deposited funds in and had previously borrowed from the financial institution to which they intended to apply for credit) were approximately three times more likely to apply for formal credit than firms that scored 0 for the proxy. Moreover, this proxy was statistically significant in our investigation of a firm's probability of obtaining credit. This suggests that the relationship banking theory, to some extent, can be applied to explain VSMEs' level of access to formal credit. In contrast, results regarding the influence of the political ties of firm owners showed that, if firm owners have strong political ties (e.g. they are members of the Communist Party, or hold a socialist position or formerly worked for a state enterprise), the firm's probability of applying for formal credit increased significantly. However, this political position did not significantly increase a VSME's probability of receiving a loan from its bank.

The impact of variables associated with transaction lending

Using the first model, we found that firms' collateral strength (i.e., large total assets and owners with land use rights), encouraged firms to apply for formal credit, as these variables were statistically significant. From the empirical results of Model 2, we found that these variables also encouraged financial institutions to supply credit to firms. However, against our expectations, large total assets did not have a negative score in Model 3, which implies that having large total assets does not help firms to obtain the full amount of credit they apply for. One possible interpretation for this is that the larger the firm, the more credit it demands; therefore, it is harder for a large firm to be satisfied by the amount of the loan it receives. However, as we expected, holding land use rights was positively correlated with a firm's ability to obtain the requested credit amount.

Table 5 Definition of variables and summary of statistics

Variable name	*Definition*	*Observations*	*Mean*	*Standard deviation*	*Minimum*	*Maximum*
Applied	Dummy variable: Applied via formal credit channel (1) or not (0)	11 451	0.305	0.46	0	1
Obtained	Dummy variable: Obtain formal credit after applying (1) or not (0)	3493	0.953	0.211	0	1
Still need	Dummy variable: Still in need of formal credit after obtaining (1) or not (0)	3493	0.6	0.49	0	1
Credit constraint (in 1 period lagged)	Category variable: Lack of credit is the biggest (3), the second biggest (2) or the third biggest (1) constraint to growth	6623	1.232	1.379	0	3
New project	Dummy variable: Plan to start up new projects or product line in near future (1) or not (0)	11 451	0.265	0.441	0	1
Bank relation	Dummy variable: Used to have deposit and borrow (1) or not (0)	11 451	0.038	0.191	0	1
Political	Dummy variable: The owner is a member of the communist party or holds a social position or used to work for state enterprises (1) or not (0)	11 451	0.03	0.17	0	1
Total asset (in 1 period lagged)	Sum of total physical assets and total financial assets in logarithmic form	6623	0.261	0.745	−16.021	33.515
Land possession	Dummy variable: The firm's owner has a Certificate of Land Use Right (1) or not (0)	11 451	0.497	0.5	0	1

(*Continues*)

Table 5 (continued)

Variable name	*Definition*	*Observations*	*Mean*	*Standard deviation*	*Minimum*	*Maximum*
Audit (in 1 period lagged)	Dummy variable: Firm's accounting books are audited (1) or not (0)	6623	0.212	0.409	0	1
Sales growth (in 1 period lagged)	Proportion of revenue in present year over the previous year	6607	32.383	2412.196	0.072	196002
ROA (in 1 period lagged)	Net profits/total assets	6623	0.261	0.745	−16.021	33.515
Out standing debt rate (in 1 period lagged)	Outstanding debt/total assets	6623	0.099	0.301	0	12.5
PCI	Regional provincial competitiveness index	11 451	0.38	0.485	0	1
Crisis	Dummy variable: Before (0) and after (1) global crisis in 2008	11 451	0.495	0.5	0	1
Firm's size	Total number of full-time employees end-year (*r*(1) Micro: 1–9, (2) Small: 10–49, (3) Medium: 50–300)	11 451	1.405	0.617	1	3
Firm's age	The number of years the firm had been in operation at the time of the survey	11 420	13.714	10.228	2	77
Owner's managerial experience	Dummy variable: the owner has managerial experience (1) or not (0)	11 451	0.0296	0.170	0.000	1
Owner's age	The age of the firm's owner	11 439	45.6245	10.615	17	94

PCI, provincial competitiveness index; ROA, return on assets

Furthermore, the proxies for a firm's profitability (high ROA score and sales growth) had no impact on whether firms applied for credit or whether financial institutions supplied credit. Having a high ROA and strong sales growth had a significant negative impact on the probability of firms receiving a loan after applying. We found that after being audited, a proxy for firms' transparency had

Table 6 Estimation results with unbalanced data

	Model 1: Applied or not			*Model 2: Obtained or not*		*Model 3: Still need formal*	
	Pooling model	*Random-effect model*	*Fixed-effect model*	*Pooling model (probit model with sample seclection)*	*Random-effect model (simple probit model with condition)*	*Pooling model (probit model with sample selection)*	*Random-effect model (simple probit model with condition)*
	Coefficient/(SE)	Coefficient /(SE)	Coefficient /(SE)	Coefficient /(SE)	Coefficient /(SE)	Coefficient /(SE)	Coefficient/(SE)
1. Credit constraint (in 1 period lagged)	0.318*	0.536**	1.558***				
	[0.187]	[0.241]	[0.487]				
2. Credit constraint (in 1 period lagged)	0.340**	0.475***	0.530*				
	[0.140]	[0.181]	[0.296]				
3. Credit constraint (in 1 period lagged)	0.454***	0.534***	0.083				
	[0.090]	[0.115]	[0.180]				
New project	0.006	0.015	0.002	−0.351**	−0.442***	0.454***	0.445***
	[0.084]	[0.107]	[0.178]	[0.150]	[0.124]	[0.069]	[0.066]
Bank relation	2.905***	3.276***	2.066***	1.419***	1.098***	−0.047	−0.018
	[0.326]	[0.363]	[0.464]	[0.454]	[0.357]	[0.097]	[0.084]
Political	0.852***	1.057***	1.043*	−0.144	−0.215	0.175	0.189
	[0.278]	[0.350]	[0.613]	[0.273]	[0.275]	[0.160]	[0.168]
Total asset (in 1 period lagged)	0.117***	0.129***	0.014	0.107**	0.080*	0.046*	0.054**
	[0.033]	[0.043]	[0.098]	[0.048]	[0.045]	[0.028]	[0.027]
Land possession	0.209**	0.207*	0.349	0.219*	0.218*	−0.171**	−0.162**
	[0.088]	[0.114]	[0.223]	[0.115]	[0.122]	[0.070]	[0.071]

(*Continues*)

Table 6 (continued)

	Model 1: Applied or not			*Model 2: Obtained or not*		*Model 3: Still need formal*	
	Pooling model	*Random-effect model*	*Fixed-effect model*	*Pooling model (probit model with sample seclection)*	*Random-effect model (simple probit model with condition)*	*Pooling model (probit model with sample selection)*	*Random-effect model (simple probit model with condition)*
Audit (in 1 period lagged)	0.255**	0.331**	−0.121	0.083	0.067	−0.009	−0.009
	[0.115]	[0.147]	[0.246]	[0.143]	[0.150]	[0.083]	[0.086]
Sales growth (in 1 period lagged)	−0.02	−0.022	0	−0.048**	−0.049**	0.03	0.029
	[0.016]	[0.016]	[0.000]	[0.023]	[0.024]	[0.028]	[0.029]
ROA (in 1 period lagged)	−0.127	−0.141	−0.244	−0.013	−0.003	0.274**	0.293***
	[0.099]	[0.118]	[0.288]	[0.102]	[0.108]	[0.108]	[0.113]
Out standing debt rate (in 1 period lagged)	0.766***	0.544**	−0.548	0.598**	0.435	0.022	0.031
	[0.205]	[0.219]	[0.374]	[0.300]	[0.274]	[0.077]	[0.079]
PCI	0.018*	0.027**	0.068**	−0.015	−0.009	−0.026***	−0.027***
	[0.010]	[0.014]	[0.032]	[0.014]	[0.014]	[0.008]	[0.008]
Crisis	−0.619***	−0.828***	−0.712***	−0.493***	−0.464***	−0.09	−0.126*
	[0.093]	[0.121]	[0.190]	[0.120]	[0.138]	[0.094]	[0.074]
Small	0.323***	0.505***	0.307	0.045	−0.021	0.005	0.013
	[0.108]	[0.144]	[0.298]	[0.154]	[0.147]	[0.083]	[0.087]
Medium	0.914***	1.336***	1.481***	0.460*	0.334	0.101	0.121
	[0.191]	[0.255]	[0.513]	[0.261]	[0.247]	[0.124]	[0.128]
Firm's age	−0.002	−0.003	0.003	−0.01	−0.008	−0.005	−0.006

(*Continues*)

Table 6 (continued)

	Model 1: Applied or not			*Model 2: Obtained or not*		*Model 3: Still need formal*	
	Pooling model	*Random-effect model*	*Fixed-effect model*	*Pooling model (probit model with sample seclection)*	*Random-effect model (simple probit model with condition)*	*Pooling model (probit model with sample selection)*	*Random-effect model (simple probit model with condition)*
	[0.005]	[0.006]	[0.014]	[0.006]	[0.006]	[0.004]	[0.004]
Owner's managerical experience	0.016	−0.105	−0.969	0.058	0.019	−0.026	−0.05
	[0.240]	[0.311]	[0.620]	[0.322]	[0.335]	[0.164]	[0.173]
Owner's age	−0.013***	−0.016***	−0.016	−0.007	−0.005	−0.007**	−0.008**
	[0.004]	[0.006]	[0.014]	[0.006]	[0.006]	[0.003]	[0.003]
Constant	−1.384**	−1.850**		1.919**	2.246**	1.543***	1.586***
	[0.623]	[0.841]		[0.901]	[0.896]	[0.483]	[0.500]
		$\ln(\sigma_v^2)$		atanh ρ	$\ln(\sigma_v^2)$	atanh ρ	$\ln(\sigma_v^2)$
		0.497**		0.354	−4.403	−0.446	−2.548***
		[0.206]		[0.347]	[18.258]	[1.033]	[0.792]
Number of observations	3137	3137	871	1910	1910	1910	1825
	LR chi^2(19) = 575.37	Wald chi^2(19) = 252.68	LR chi^2(19) = 108.85	Wald chi^2(16) = 59.36	Wald chi^2(16) = 32.70	Wald chi^2(16) = 116.64	Wald chi2 (16) = 111.85
	Prob > chi^2 = 0.0000	Prob > chi^2 = 0.0000	Prob > chi^2 = 0.0000	Prob > chi^2 = 0.0000	Prob > chi^2 = 0.0081	Prob > chi^2 = 0.0000	Prob > chi2 = 0.0000

PCI, provincial competitiveness index; ROA, return on assets

Table 7 Estimation results with balanced data

	Model 1: Applied or not		*Model 2: Obtained or not*		*Model 3: Still need formal*	
	Pooling model	*Random-effect model*	*Pooling model (probit model with sample seclection)*	*Random-effect model (simple probit model with condition)*	*Pooling model (Probit model with sample seclection)*	*Random-effect model (Simple probit model with condition)*
	Coefficient/(SE)	Coefficient/(SE)	Coefficient/(SE)	Coefficient/(SE)	Coefficient/(SE)	Coefficient/(SE)
1. Credit constraint (in 1 period lagged)	0.23	0.374				
	[0.320]	[0.393]				
2. Credit constraint (in 1 period lagged)	0.328	0.446				
	[0.228]	[0.283]				
3. Credit constraint (in 1 period lagged)	0.421***	0.442**				
	[0.146]	[0.180]				
New project	−0.107	−0.114	−0.700***	−0.657***	0.317***	0.427***
	[0.136]	[0.167]	[0.195]	[0.198]	[0.098]	[0.108]
Bank relation	2.737***	2.997***	0.408	0.658*	0.094	0.042
	[0.524]	[0.577]	[0.655]	[0.398]	[0.134]	[0.143]
Political	1.030**	1.060**	−0.334	−0.291	0.283	0.432
	[0.429]	[0.531]	[0.421]	[0.418]	[0.258]	[0.294]
Total asset (in 1 period lagged)	0.165***	0.166**	0.057	0.09	−0.004	−0.015
	[0.056]	[0.070]	[0.114]	[0.071]	[0.040]	[0.043]
Land possession	0.377***	0.364**	−0.164	−0.142	−0.018	0.004
	[0.145]	[0.183]	[0.198]	[0.203]	[0.107]	[0.118]
Audit (in 1 period lagged)	0.14	0.207	−0.101	−0.107	0.18	0.175
	[0.196]	[0.241]	[0.243]	[0.249]	[0.132]	[0.143]
Sales growth (in 1 period lagged)	−0.036	−0.007	0.176	0.181	0.022	0.021

(*Continues*)

Table 7 (continued)

	Model 1: Applied or not		*Model 2: Obtained or not*		*Model 3: Still need formal*	
	Pooling model	*Random-effect model*	*Pooling model (probit model with sample seclection)*	*Random-effect model (simple probit model with condition)*	*Pooling model (Probit model with sample seclection)*	*Random-effect model (Simple probit model with condition)*
	[0.078]	[0.081]	[0.317]	[0.332]	[0.035]	[0.035]
ROA (in 1 period lagged)	−0.282	−0.316	0.042	0.007	0.709***	0.820***
	[0.230]	[0.273]	[0.287]	[0.278]	[0.216]	[0.254]
Out standing debt rate (in 1 period lagged)	1.864***	1.757***	0.134	0.375	0.157	0.099
	[0.444]	[0.504]	[0.706]	[0.467]	[0.211]	[0.226]
PCI	0.040**	0.050**	0.008	0.005	−0.017	−0.018
	[0.016]	[0.021]	[0.019]	[0.019]	[0.012]	[0.013]
Crisis	−0.880***	−1.067***	−0.433	−0.502**	−0.086	−0.014
	[0.152]	[0.185]	[0.303]	[0.209]	[0.111]	[0.120]
Small	0.188	0.33	−0.208	−0.162	0.208	0.279*
	[0.184]	[0.237]	[0.260]	[0.252]	[0.130]	[0.144]
Medium	0.897***	1.313***	−0.159	−0.034	0.315*	0.370*
	[0.322]	[0.417]	[0.449]	[0.379]	[0.190]	[0.208]
Firm's age	0.003	0.003	−0.009	−0.01	0.001	0.003
	[0.007]	[0.010]	[0.011]	[0.011]	[0.006]	[0.007]
Owner's managerical experience	0.328	0.226	4.617	0	−0.33	−0.461
	[0.436]	[0.546]	[1948.249]	[.]	[0.280]	[0.298]
Owner's age	−0.021***	−0.024***	0.012	0.008	−0.009*	−0.010*
	[0.007]	[0.009]	[0.014]	[0.010]	[0.005]	[0.006]
Constant	−2.524**	−2.995**	1.359	1.076	0.928	1.049

(*Continues*)

Table 7 (continued)

	Model 1: Applied or not		*Model 2: Obtained or not*		*Model 3: Still need formal*	
	Pooling model	*Random-effect model*	*Pooling model (probit model with sample seclection)*	*Random-effect model (simple probit model with condition)*	*Pooling model (Probit model with sample seclection)*	*Random-effect model (Simple probit model with condition)*
	[0.997]	[1.309]	[1.332]	[1.285]	[0.745]	[0.803]
		$\ln(\sigma_v^2)$	atanh ρ	$\ln(\sigma_v^2)$	atanh ρ	$\ln(\sigma_v^2)$
		0.333	−0.384	−10.617	12.729	−2.172***
		[0.301]	[1.142]	[190.063]	[26.578]	[0.776]
Number of observations	1223	1223	2694	715	738	709
	LR $chi^2(19)$ = 256.26	Wald $chi^2(19)$ = 122.90	Wald $chi^2(16)$ = 20.83	Wald $chi^2(15)$ = 21.02	Wald $chi^2(16)$ = 47.76	Wald $chi^2(16)$ = 48.30
	Prob > chi^2 = 0.0000	Prob > chi^2 = 0.0000	Prob > chi^2 = 0.1850	Prob > chi^2 = 0.1362	Prob > chi^2 = 0.0001	Prob > chi^2 = 0.0000

PCI, provincial competitiveness index; ROA, return on assets

a positive impact only on encouraging firms to apply for formal credit. Conversely, having a high outstanding debt ratio had a positive influence on the probability of firms applying for and obtaining credit. These empirical results reveal that Vietnamese financial institutions seem to rely more on VSMEs' tangible assets than on their financial statements. Of course, if firms reinvest their profits in the business, they may not need to obtain external credit; however, if profitable firms can obtain credit from financial institutions, they might be able to invest more and conduct more innovative and profitable activities.

The impact of the business environment variables

We hypothesized that the business environment would have a positive effect on a firm's probability of applying for and obtaining a sufficient level of credit, and our results confirmed that hypothesis. A good business environment helped firms apply for formal credit and increased the level of credit they obtained. Conversely, the 2008 global financial crisis reduced the probability of firms applying for as well as obtaining credit. This result is reasonable because post-financial crisis, financial institutions have been more careful in supplying credit, especially to VSMEs.

The impact of firm owners' attributes and firms' attributes

Regarding firm owners' attributes and firms' attributes, we found that larger firms had a higher probability of applying for and obtaining credit compared to the smaller firms, This result is associated with firms' creditworthiness. However, the probability of firms applying for credit decreased as the age of the firm's owner increased, indicating that older owners may prefer to not access credit from external sources.

IV.2 Empirical results with balanced data

Our empirical findings, presented in Table 6, are based on the pooling model with a cross-sectional dataset and the fixed-effect and random-effect models with the unbalanced dataset. The difference between these results was minor. Next, we implemented exactly the same data construction and empirical strategies using the balanced dataset and found that the results were qualitatively unchanged (Table 7). We also conducted the Hausman test to check the significance of the fixed-effect model over the random-effect model. Our results were $Chi^2(11) = 10.33$ and $Prob > chi^2$ is 0.501. Therefore, we adopted the estimation results of the pooling model and the random-effect model. Comparing the results, we found a notable difference; namely, the lower significance of some important variables such as PCI and bank relationship can be attributed to the decreased number of samples. However, we found no other significant differences compared to the previous results.

Compared to the results of previous studies, we offer several interesting findings. First, we find a positive association between VSMEs' total assets and the probability of applying for a loan, consistent with Nguyen and Luu's (2013) and Rand's (2007) findings. In addition, as in prior work, the role of land possession was shown to significantly affect the probability of applying for formal credit. Moreover, the present study finds that a good business environment, lack of credit, and a banking relationship significantly encourage firms to apply for formal credit; this finding not been addressed in previous research.

In terms of obtaining formal credit, we reach the same conclusion as Vo et al. (2011) about the role of tangible assets and total assets and as Uchida (2011) regarding the importance of banking relationships. However, our two-step analysis clearly showed that land possession, and not banking relationship, is the key factor that determines a firm's satisfaction after applying. In contrast, as opposed to previous studies, we did not find a VSME's financial performance to be important in explaining whether it obtained formal credit.

V. Conclusion

In this study, we followed the process that VSMEs go through to obtain formal credit. We investigated the factors that determine whether VSMEs apply for credit from formal financial institutions and obtain that credit, as well as the factors that determine the level of credit these VSMEs obtain. The analytical models we employed were the logit and probit with sample selection models, using panel data achieved from VSME surveys conducted from 2005 to 2013.

The results of our probability calculations made the following points about VSME financing clear. First, the fact that firms that lack credit tend to apply for formal credit proves the important role of formal credit channels in supplying credit. Second, regarding the factors associated with relationship banking, we found that firm owners' political ties had a positive relationship with their firm's probability of applying for formal credit, but the relationship between political ties and obtaining credit was unclear, while the history of transacting with the applying financial institutions was significant. Third, regarding the factors associated with transaction lending, we found that firms' financial performance had almost no influence on whether they applied for or successfully obtained credit. Possessing land use rights was shown to be an important part of credit procurement, and land possession had a significant impact on the probability of firms obtaining credit, as we had predicted. Fourth, we observed that efforts of local governments to improve the business environment for private local firms had a small but positive influence on those firms' ability to access credit. Finally, VSMEs' likelihood of applying for formal credit as well as the probability of financial institutions' supplying credit appears to have been negatively affected by the 2008 global financial crisis.

Our analysis has highlighted that loans to SMEs in Vietnam can make a significant contribution to growth in the enterprises that receive them. However, the fact that there are firms that require credit but do not seek it from formal institutions indicates that there is a barrier between financial institutions and VSMEs. We suggest that implementing the following strategies and policies may help VSMEs bring down this barrier. Financial institutions should lend funds more proactively and should improve their communication with and advertising to VSMEs. Financial institutions should pay more attention to VSMEs' performance and business plans to meet not only the individual firms' need for credit but also the country's development goals. For example, to support the goal of promoting 'green industries', an assistance fund could be offered to firms manufacturing environmentally-friendly products. In addition, with the purpose of supporting industries producing components, spare parts or other such goods, VSMEs should be granted non-refundable assistance or the like. Moreover, to reduce the dependence on tangible assets in supplying credit, policy-makers should examine the experiences of other developing countries and take advantage of international development assistance funds for SMEs. Next, firms that need funds should be encouraged to approach financial institutions; they should be made aware that if they apply, they are highly likely to obtain at least a portion of their desired level of funding. Finally, by improving the local business environment, regional governments can indirectly make it easier for firms to access financing; therefore, governments should continue to implement policies to that end.

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